

## RECORDS REVISION OF *LUTZOMYIA INTERMEDIA* COMPLEX (DIPTERA, PSYCHODIDAE, PHLEBOTOMINAE)

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### ABSTRACT

RECORDS REVISION OF *LUTZOMYIA INTERMEDIA* COMPLEX (DIPTERA: PSYCHODIDAE, PHLEBOTOMINAE). The *Lutzomyia intermedia* complex, *L. intermedia* (Lutz & Neiva, 1912) and *L. neivai* (Pinto, 1926), is analyzed, based on specimens from Brazil, Argentina, Paraguay and Bolivia, and in the related publications. Bibliographical references to *Phlebotomus intermedius* not referring to the *L. intermedia* complex also are listed and commented.

KEYWORDS. *Lutzomyia intermedia*, *L. neivai*, distribution, synonymy, Phlebotominae.

### INTRODUCTION

Phlebotomine sandflies of the *Lutzomyia intermedia* complex have been incriminated as vectors of parasites causing cutaneous leishmaniasis (ROMAÑA & ABALOS, 1949; RANGEL; SOUZA *et al.*, 1984; DEANE & GRIMALDI JR, 1985; GOMES & GALATI, 1987; GOMES; COUTINHO *et al.*, 1990; SÃO-THIAGO & GUIDA, 1990).

After the concise description of *Lutzomyia intermedia* by LUTZ & NEIVA (1912), in the genus *Phlebotomus*, the name *P. intermedius* became widely used by several authors, referring to different insects. *Lutzomyia neivai* (PINTO, 1926) was described in *Phlebotomus*, and its synonymy with *L. intermedia* was proposed by DYAR (1929).

MARCONDES (1996), based on the observation of morphological differences between females of both entities, removed *L. neivai* from the synonymy of *L. intermedia*. The *L. intermedia* complex is currently composed by *L. intermedia sensu stricto* and *L. neivai*. The specific distinction of females is based mostly on the size, number of rings and shape

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of head of the spermathecae and on the number of posterior teeth of cibarium (MARCONDES, 1996). The study of mitochondrial DNA indicated that some sequences are associated to each species, but some introgression was observed (MARCONDES *et al.*, 1997). The importance of the female cibarium and the spermathecae and their ducts in the characterization of South American sandflies was evidenced by THEODOR (1932). The spermathecae of *L. intermedia* were illustrated and described by NITZULESCU (1930) and COSTA-LIMA (1932).

A list of these references was organized, with comments on their probable meaning, based on a study of the morphology of specimens of the *L. intermedia* complex from several origins (MARCONDES, 1995, 1996), on the analysis of the known geographical distribution of *L. intermedia* and *L. neivai* (MARCONDES; LOZOVEI & VILELA, 1998) and data from bibliography.

The aim is to review the references of *L. intermedia* complex in the literature to clear the taxonomy of the *L. intermedia* complex. References to *Phlebotomus intermedius* not related to *L. intermedia* are listed under the probable species to which they are related.

### MATERIAL AND METHODS

Specimens of either sexes of the *L. intermedia* complex, most identified to specific level, from 12 States of Brazil (Ceará, Pernambuco, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Goiás, Paraná, Santa Catarina and Rio Grande do Sul), and from Argentina, Paraguay and Bolívia, were studied and listed under each species.

Collections: ACR, Alfredo C. R. Azevedo, IOC, Rio de Janeiro, Rio de Janeiro; CPRR, Centro de Pesquisas René Rachou, Belo Horizonte, Minas Gerais; ENSP, Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz, Rio de Janeiro; FSP, Departamento de Epidemiologia, Faculdade de Saúde Pública, Universidade de São Paulo, São Paulo; GMA, Gustavo Marins de Aguiar; IAL, Instituto Adolfo Lutz, São Paulo; IBSP, Instituto Butantan, São Paulo; IEC, Instituto Evandro Chagas, Belém, Pará; IOC, Instituto Oswaldo Cruz Collection, Rio de Janeiro; MIP, Departamento de Microbiologia e Parasitologia, Centro de Ciências Biológicas, Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina; RPB, Reginaldo Peçanha Brazil, CPRR, Belo Horizonte, Minas Gerais; UEM, Ueslei Teodoro, Universidade Estadual de Maringá, Paraná; UFRP, Universidade Federal Rural de Pernambuco, Recife, Pernambuco; USNM, United States National Museum, Washington.

Abbreviations: descr., description; ecol., ecology; epid., epidemiology; exp. inf., experimental infection; distr., geographical distribution; lab., laboratory; morph., morphology; nat. inf., natural infection; redescr., redescription; refs, references; syst., systematics; tax., taxonomy; type loc., type locality.

### *Lutzomyia* França, 1924

*Lutzomyia* FRANÇA, 1924 (subgenus of *Phlebotomus*); THEODOR (1948) (genus defined).

Although other classifications have been proposed for the American sandflies (e. g., FORATTINI, 1971; ARTEMIEV, 1991), those of MARTINS *et al.* (1978) and YOUNG & DUNCAN (1994), which did not split *Lutzomyia*, have been widely accepted. BARRETO (1962) accepted seven subgenera in *Lutzomyia* (*Lutzomyia* França, 1924, *Evandromyia* Mangabeira, 1941, *Psychodopygus* Mangabeira, 1941, *Viannamyia* Mangabeira, 1941, *Pressatia* Mangabeira, 1942 and *Dampfomyia* Addis, 1945) and proposed seven additional ones (*Micropygomyia*, *Sciopemyia*, *Helcocyrtomyia*, *Trichophoromyia*, *Trychopygomyia*, *Nyssomyia* and *Psathyromyia*).

*Lutzomyia* (*Nyssomyia*) *intermedia* (Lutz & Neiva, 1912)

- Phlebotomus intermedius* LUTZ & NEIVA, 1912:92. Type loc.: Ouro Fino Farm, currently Mun. Além Paraíba, Minas Gerais, Brazil, type not found. A female neotype, from this locality, was designated by MARCONDES (1996) and deposited in FSP (code: DE/FSP-E-10975), with a male collected in the same data (code: DE/FSP-E-10977). ARAGÃO, 1922 (exp. inf.); NITZULESCU, 1930: fig. 7 (morph. ♀) (Rio de Janeiro); ROOT, 1934: figs. 3, 4a (Espírito Santo, Santa Teresa, São João de Petrópolis) (material not available to study); CHAGAS, 1939, PARAENSE & CHAGAS, 1940 (exp. inf.) [Rio de Janeiro (Wladimir Lobato Paraense, pers. commun., 1997)]; LUCENA, 1949 (distr.) (Pernambuco); LUCENA, 1950, 1953 (distr.) (Pernambuco, Paraíba). NERY-GUIMARÃES & BUSTAMANTE, 1954 (epid. and control) (*lapsus Flebotomus*) (Rio de Janeiro, Magé).
- Lutzomyia intermedia*; THEODOR, 1948:104 (genus defined), MAYRINK *et al.*, 1979 (distr., epid., dissection) (Minas Gerais, Rio Doce Valley); READY & FRAHIA, 1981 (tax.) (Paul Donald Ready, pers. commun., 1996) (Bahia); LIMA *et al.*, 1981, SOUZA *et al.*, 1981 (ecol., epid.) (Rio de Janeiro); FALCÃO *et al.*, 1991 (insecticide control), BARROS *et al.*, 1985 (epid.) (Espírito Santo, Viana, Cariacica); AGUIAR & SOUCASAU, 1984 (distr.) (Rio de Janeiro, Teresópolis), RANGEL *et al.*, 1985 (distr.) (Minas Gerais, Além Paraíba); AGUIAR *et al.*, 1987, RANGEL *et al.*, 1984, 1986 (ecol., nat. inf.), 1987 (lab. breeding, biol. immatures), WERMELINGER *et al.*, 1987 (lab. breeding), OLIVEIRA-NETO *et al.*, 1988 (ecol., epid.), RANGEL *et al.*, 1990 (epid.), (Rio de Janeiro); PEREIRA & HOCH, 1990 (Bahia); RANGEL *et al.*, 1992, 1993 (exp. inf.); AGUIAR *et al.*, 1993 (ecol., nat. inf.), SOUZA *et al.*, 1995, OLIVEIRA *et al.*, 1995 (distr., epid.), SOUZA *et al.*, 1996 (distr.) (Rio de Janeiro); MARCONDES, 1996:457 (redescr. female) (Minas Gerais, Além Paraíba); SHERLOCK *et al.*, 1996 (epid.) (Bahia); REBÊLO *et al.*, 1996 (distr.) (Maranhão); ANDRADE FILHO *et al.*, 1997 (distr.) (Minas Gerais, Timóteo).
- Sergentomyia intermedia*; BARRETTO & ZAGO FILHO, 1956 (distr.) (Rio de Janeiro, Petrópolis).
- Lutzomyia* (*N.*) *intermedia*; Barretto, 1962:98.

The identification of many specimens from Northeastern Brazil, Espírito Santo and Rio de Janeiro as *L. intermedia* s. s. (MARCONDES *et al.*, 1998), the morphology (ARAGÃO, 1922; NITZULESCU, 1930; ROOT, 1934) and the figures, in the last two references, besides the origin, induce the conclusion that this material can be identified to this species. The insects studied by PARAENSE & CHAGAS (1940), NERY-GUIMARÃES & BUSTAMANTE (1954), AGUIAR *et al.* (1993), RANGEL *et al.* (1984, 1990), BARROS *et al.* (1985), READY & FRAHIA (1981), PEREIRA & HOCH (1990) also probably belong to this species.

Examined material. BRAZIL. Ceará: Crato (Bucanha), 25.V.1994 (CPRR), 7°14'3"S 39°24'34"W, 427 m, 2 ♂; Pernambuco: Jaboatão dos Guararapes, 12.XI.1974, (UFRP) 8°6'46"S 35°0'53"W, 76 m, 1 ♀, Vitória de Santo Antão (Usina Nossa Senhora do Carmo), [LUCENA (1949)], (UFRP) 8°7'5"S 35°17'19"W, 157 m, 10 ♀, 1 ♂; Moreno (Moreno and Engenho Moreno) and Jaboatão dos Guararapes (Carauína), [OLIVEIRA *et al.* (1977/1978)], (UFRP) 8°07'07"S 35°05'32"W, 96.6 m, and 8°6'46"S 35°0'53"W, 76 m, respectively, 1 ♀, 1 ♂; Quipapá, 14.XII.1949, (UFRP) 8°49'40"S 36°0'42"W, 462 m, 8 ♀, 1 ♂; Sergipe: Nossa Senhora do Socorro (Povoado Cardoso), 22.IX.1994 (CPRR) 10°51'18"S 37°7'34"W, 36.3 m, 1 ♂; Bahia: Ilhéus, 1991, (ACR) 14°47'20"S 39°2'58"W, 52.2 m, 1 ♀, 7 ♂; Juazeiro, Bahia, (ox corral) 13.VIII.1965, (FSP) 9°24'49"S 40°30'11"W, 368 m, 1 ♂; Minas Gerais: Além Paraíba (Faz. Cachoeira), 13.II.1959, (CPRR) 21°53'16"S 42°42'16"W, 140 m, 4 ♂; Além Paraíba (Ouro Fino Farm), 28-30.IV.1995, (MIP) 21°53'16"S 42°42'16"W, 140 m, 2 ♀, 8 ♂; Conselheiro Pena, 21.IX.1958, (FSP) 19°10'20"S 41°28'20"W, 121 m, 1 ♂; Governador Valadares, VI.1946, VII.1946, (IOC- from Coll. O. Mangabeira Filho), 18°51'04"S 41°56'58"W, 170 m, (17 ♂); Juiz de Fora, 23.I.1959, (CPRR) 21°45'51"S 43°21'01"W, 695 m, 1 ♂; Lagoa Santa (Lapinha), IV.1991, (CPRR) 19°37'38"S 43°53'23"W, 760 m, 1 ♀, 1 ♂; Timóteo, III.1995, (CPRR) 19°34'57"S 42°38'40"W, 333 m, 4 ♀; Espírito Santo: Venda Nova do Imigrante, 1994 (MIP), 20°20'23"S 41°08'05"W, 750 m, 52 ♀, 31 ♂; Viana, VI.1994, (MIP) 20°23'25"S 40°29'46"W, 34 m, 19 ♀, 17 ♂; Rio de Janeiro: Cachoeiras de Macacu, (RPB) 22°27'45"S 42°39'11"W, 58 m, 4 ♀, 12 ♂; Cardoso Moreira, 1941, (IOC-from Coll. O. Mangabeira), 21°29'18"S 41°36'56"W, 22 m, 2 ♀; Cordeiro (Macuco), 16.III.1988, (RPB) 22°01'43"S 42°21'39"W, 485 m, (6 ♀, 14 ♂); Itaguaí, 1985 (several months), (GMA) 22°51'08"S 43°46'01"W, 13 m, 4 ♀, 5 ♂; Niterói (Itaipu), 1987 (several months), (RPB), 22°53'S 43°06'13"W, 5 m, 8 ♀, 10 ♂; Parati, 1990 (several months),

(GMA) 23°13'04"S 44°42'47"W, 5 m, 5 ♀, 5 ♂; Rio Bonito (Catimbau Grande), V. 1987, (RPB) 22°42'30"S 42°37'34"W, 62 m, 11 ♀, 14 ♂; **São Paulo**: São Sebastião (Jaraguá), 30.VIII.1994, (MIP) 23°45'36"S 45°24'35"W, 5 m, 13 ♀, 15 ♂; Eldorado, IX.1991, (IAL) 24°31'12"S 48°06'29"W, 62 m, 11 ♀, 10 ♂; Miracatu (Quiri Road), 16.XI.1993, (FSP) 24°16'53"S 47°27'35"W, 27 m, 1 ♀, 15 ♂; Pariquêra Açu, (Town Hall) 6.II.1991, (Experimental Henhouse II), VII.1977, 7.I.1991 (14 ♀, 4 ♂); Pedro de Toledo (São Lourenço), 20.IX.94, (FSP) 24°16'29"S 47°13'58"W, 45 m, 10 ♀, 9 ♂; idem, 22.III.94, (FSP) 24°16'29"S 47°13'58"W, 45 m, 1 ♀; Ubatuba (Camburi), 25.III.93, idem, 17.III.1993, (FSP) 23°26'12"S 45°04'16"W, 3 m, 1 ♀, 2 ♂; ibidem (Picinguaba), 29.XI.1990, (GMA), 10 ♀, 10 ♂; ibidem (Anchieta Island= Porcos Island), 1.IX.1993, (FSP), 11 ♀, 7 ♂.

### *Lutzomyia (N.) neivai* (Pinto, 1926)

*Phlebotomus neivai* PINTO, 1926:371, 373, 374. Type loc.: São Paulo, São Paulo, Brazil. The holotype (IOC) was examined. MARCONDES, 1996:459 revalidated the species and deposited a female in the FSP (code: DE/FSP-E-10971).

*Phlebotomus mazzai* PATERSON, 1926:305; type loc.: San Pedro de Jujuy, **Jujuy**, Argentina. DYAR, 1929 (syn.) Type(s) not available to study.

*Phlebotomus intermedius*; THEODOR, 1932, figs 4a, b (tax., redescri.); ANTUNES & COUTINHO 1939, figs 3b, 5g; (cf. to *L. whitmani*) (São Paulo, São Paulo); PRIMIO, 1937, PINTO, 1941 (distr.) (Rio Grande do Sul); BARRETTO, 1950 (distr.); FORATTINI & SANTOS, 1952 (nat. inf.) (Colônia Inajá?) (Paraná); FORATTINI, 1954 (nat. inf., epid.) (Mato Grosso do Sul, São Paulo, Paraná); GONZALEZ & ARCE QUEIROLO, 1955 (distr., epid.) (PARAGUAY); FORATTINI & SANTOS, 1956 (Mato Grosso do Sul); MARTINS *et al.*, 1956 (distr.) [Minas Gerais, Lagoa Santa (Lapinha)]; LIMA *et al.*, 1958 (ecol., epid.) (Paraná); FORATTINI, 1960a (distr.) (Mato Grosso do Sul); FORATTINI, 1960b, GOMES *et al.*, 1978, GOMES; BARATA *et al.*, 1989, (West of São Paulo); CARVALHO *et al.*, 1989 (ecol., epid.) (Goíás, Tocantins); STOLF *et al.* (1993) (ecol., epid.) (West of São Paulo).

*Phlebotomus singularis* COSTA-LIMA, 1932:50 [São Paulo, Franco da Rocha (Juqueri)]. Type not available in IOC (Sebastião Oliveira, pers. commun.).

*Psychodopygus intermedius*; FORATTINI *et al.*, 1972, FORATTINI, 1973:418, FORATTINI *et al.*, 1976, GOMES & GALATI, 1989 (ecol., epid.) (West of São Paulo).

*Lutzomyia intermedia*; MARTINS *et al.*, 1961 (distr.) (Paraná, Santa Catarina); TANIGUCHI *et al.*, 1989, 1991 (distr.), 1992 (anomaly) (São Paulo); SÃO THIAGO & GUIDA, 1990 (ecol., epid.) (Santa Catarina); TEODORO, LA SALVIA FILHO *et al.*, 1991, 1993a, 1993b, (Paraná); HASHIGUCHI *et al.*, 1991, 1992 (ecol., epid.) (PARAGUAY); YOUNG & DUNCAN, 1994, fig. 193 (distr., descr.); SALOMÓN *et al.*, 1995 (ecol., epid.) (ARGENTINA: Salta); SILVEIRA *et al.*, 1996, TEODORO, KUHLE *et al.*, 1997, TEODORO & KUHLE, 1997, (ecol., epid.) (Paraná); CONDINO *et al.*, 1998, MAYO *et al.*, 1998 (ecol., epid.) (West of São Paulo); CAMPBELL-LENDRUM *et al.*, 1999 (ecol.) (Paraná).

*Lutzomyia mariae* MARCONDES, 1995:235 (MARCONDES, 1996, syn.).

*Lutzomyia neivai*; MARCONDES, 1996:458 (descr. female, revalidation), (BOLIVIA: Tarija, Fortín Campero); MARCONDES, LE PONT & LOZOVEI, 1998 (BOLIVIA, anom.), MARCONDES, LOZOVEI & VILELA, 1998 (distr.).

*Lutzomyia (N.) neivai*; BARRETTO, 1962:98.

The probable identification of the material of THEODOR (1932, fig. 4a, b), ANTUNES & COUTINHO (1939, figs. 3b, 5g), FORATTINI & SANTOS (1952), GOMES, BARATA *et al.* (1989) and STOLF *et al.* (1993) to *L. neivai* is based in morphology, in the first two references, and in the known geographical distribution of *L. neivai* (MARCONDES; LOZOVEI & VILELA, 1998), in the others. The morphology of the specimen represented by FORATTINI (1973) is typical of this species (MARCONDES 1996, fig. 2).

All the identified specimens from Argentina, Bolivia and Paraguay (MARCONDES; LE PONT & LOZOVEI, 1998, MARCONDES; LOZOVEI & VILELA, 1998) belonged to *L. neivai*. Some of them were collected in the north of Argentina, where the type material of *P. mazzai* was obtained. The choice of *L. neivai*, instead of "*L. mazzai*", is due to the greater



probability of the publication of the description of that species before that of the last. The description of *L. neivai* was published at 31 June 1926 and the time of the publication of *P. mazzai* by "Imprensa de la Universidad", of Buenos Aires, could not be uncovered. The publication of the abstracts of both descriptions in Tropical Diseases Bulletin is an indirect evidence to support the priority of *L. neivai*. The abstract of *L. neivai* and the preliminary note of *P. araozi* [= *L. migonei* (França, 1920) (DYAR, 1929)] was published at June 1927, and that of *Phlebotomus mazzai*, with that of the full description of *P. araozi*, certainly published after the preliminary note, at November 1927. Possibly the alphabetical order or the initial number of the papers (67 to *P. mazzai* and 371 to *L. neivai*) induced COSTA-LIMA (1932) and FORATTINI (1971), differently of all other, to arrange them in this order in the list of synonyms, respectively, of *Phlebotomus intermedius* and *Psychodopygus intermedius*.

Many sandflies from western São Paulo (TANIGUCHI *et al.*, 1989, 1991, 1992), Paraná (TEODORO; LA SALVIA FILHO *et al.*, 1991, 1993a, 1993b, SILVEIRA *et al.*, 1996; TEODORO; KUHLM *et al.*, 1997; TEODORO & KUHLM, 1997) and Santa Catarina (SÃO-THIAGO & GUIDA, 1990) States, including the anomalous insect of TANIGUCHI *et al.* (1992), were studied, and all were identified as *L. neivai*. The material of TEODORO; LA SALVIA FILHO *et al.* (1991) was morphometrically studied. Although we did not get informations on the provenance of the insect figured by YOUNG & DUNCAN (1994), its morphology seems to be similar to that of *L. neivai* (MARCONDES, 1996, fig. 2).

*L. mariae* was proposed by MARCONDES (1995) before the females of *L. neivai* in IBSP, from the type locality, were examined. This examination induced the proposal of revalidation of *L. neivai* (MARCONDES, 1996). *P. singularis* was considered as a synonym of *L. intermedia* (BARRETTO, 1947; MARTINS *et al.*, 1978). The spermathecae of the former species resemble those of *Lutzomyia intermedia*, its description was based in bad type material, not re-examined, and the description is too concise (YOUNG & DUNCAN, 1994). Due to its provenance, near the city of São Paulo, type locality of *L. neivai*, and the figure of the spermathecae, with only 7 rings (COSTA-LIMA, 1932; MARCONDES, 1996, fig. 2), it is probably a synonym of *L. neivai*.

Examined material. BRAZIL. Goiás: Itumbiara (Ribeirão das Antas), 23.VI.1975, (CPRR) 18°25'11"S 49°13'03"W, 449 m, 3 ♀, 3 ♂; Minas Gerais: Alfenas, 10.XI.1958, (CPRR) 21°25'45"S 45°56'50"W, 882 m, 1 ♀; Bambuí (Capoeirão Farm), 18.III.1958, (CPRR), 20°00'23"S 45°58'37"W, 706 m, 1 ♀, 1 ♂; João Pinheiro, IV.1995, (CPRR), 17°44'33"S 46°10'21"W, 766 m, 1 ♀, 1 ♂; Paracatu, 28.III.1958, (CPRR) 17°13'20"S 46°52'29"W, 687 m, 8 ♂; Perdões (Pádua Farm), 31.III.1960, (CPRR) 21°05'27"S 45°05'29"W, 842 m, 2 ♀, 2 ♂; Pompeu, (CPRR) 19°13'28"S 44°56'07"W, 658 m, 3 ♀, 4 ♂; São Paulo: Angatuba, 26.07.71, VIII.1971, 23°29'26"S 48°24'46"W, 624 m, (FSP) 2 ♀, 1 ♂; Araçatuba (FSP) 21°12'32"S 50°25'58"W, 390 m, 1 ♀; Atibaia (Nossa Toca Farm), 14.IX.1993, (FSP), 23°7'01"S 46°33'01"W, 803 m, 1 ♀, 1 ♂; Dourado, 2.XII.1981, 20.IV.1980, 1981, 6.V.1990, (FSP) 22°06'S 48°19'03"W, 706 m, 3 ♀, 1 ♂; Guaira (Jataí Farm), 1972, (FSP) 20°19'06"S 48°18'38"W, 517 m, 2 ♀, 2 ♂; Itupeva, 21.IX.92, (FSP) 23°58'56"S 47°52'32"W, 684 m, 2 ♀, 4 ♂; Minas Gerais-São Paulo Frontier, Rio do Peixe Valley, between Lindóia (SP) and Monte Sião (MG), 26.II.1991, (FSP), ca. 22°28' 46'36"W, ca. 700-750 m, 1 ♂; Moji-Guaçu (Cachoeirinha III Farm), 5.VIII.1992, (FSP) 22°22'20"S 46°56'32"W, 632 m, 1 ♂; Natividade da Serra (Marmelada), 21.III.94, (FSP) 23°22'32"S 45°26'31"W, 720 m, 5 ♀, 3 ♂; Paríqüera Açu (Procuradoria), 1.IV.1991, 7.I.1985, 2 ♀; (Paríqüera Mirim) 5.XII.1984 (FSP), 1 ♀; (Experimental Farm), VII.1977, 8.VI.1978 (in coitus), 27.I.1979 (two couples in coitus), 6.III.1980, 7.I.1985, 7.XII.1985, 21.I.1991, 29.I.1991, 9 ♀, 3 ♂; Porto Ferreira, 31.VI.1992, (FSP) 21°51'14"S 47°28'45"W, 559 m, 1 ♀, 1 ♂; São Luís do Paraitinga (Alvarenga), 18.XII.93, (FSP) 23°13'18"S 45°18'36"W, 742 m, 5 ♀, 6 ♂; São Paulo (Butantan), 16.VI.1926, 2.VII. 1926 (holotype of *Phlebotomus neivai*), (IOC), 2. VII. 1926 and 9. VII.1926, 2.V.1937 (code: 2287- 3 ♀), 21.II.1937 (code: 2298- 4 ♀, 2299-

4 ♂, 13.V.1936 (code: 2305-4 ♀), (IBSP) 23°32'51"S 46°38'10"W, 760 m, 11 ♀, 5 ♂; São Roque, 19.I. 1990, (IAL) 23°31'45"S 47°08'07"W, 771 m, 11 ♀, 9 ♂; Teodoro Sampaio, X. 1991, (IAL) 23°31'57"S 52°10'03"W, 321 m, 10 ♀, 8 ♂; **Paraná**: Cianorte, 23, 24.XI.1988, (GMA) 23°39'48"S 52°36'18"W, 543 m, 4 ♀, 5 ♂; Fênix, 24.V.87, (MIP) 23°54'58"S 51°58'45"W, 365 m, 1 ♀; Jussara, 1992 and 1993, (UEM), idem, XI. 1988, (GMA) 23°37'17"S 52°28'10"W, 382 m, 6 ♀, 8 ♂; **Santa Catarina**: Florianópolis (Córrego Grande), (MIP) 27°35'48"S 48°32'57"W, 25 m, 5 ♀, 3 ♂; **Rio Grande do Sul**: Santa Maria, 1. IV. 1941, (IOC) 29°41'03"S 53°48'25"W, 151 m, 2 ♀; Tenente Portela (Parque Est. Turvo), 1.II.1986, (CPRR) 27°22'16"S 53°45'30"W, 390 m, 2 ♂; **PARAGUAY**: Limoy, 19.I.1991, (ENSP), ca. 25°47'S 55°11'W, 9 ♀, 13 ♂; **ARGENTINA**: **Salta**: Pichanal ('Barrio de Villa Rallé'), 7.X. 1993, (MIP) 23°17'20"S 64°13'10"W, 10 ♀, 10 ♂; **Tucumán**: El Corte (Tafi Viejo), XII.1970 and I.1971, (FSP) 26°43'30"S 65°15'47"W, 4 ♀, 12 ♂; **BOLIVIA**: **Tarija**: Fortín Campero), (MIP) 22°50'S 64°17'W, 14 ♀, 2 ♂.

### *Lutzomyia (N.) antunesi* (Coutinho, 1939)

*Phlebotomus antunesi* COUTINHO, 1939:181. Type loc.: Manacapuru, Amazonas, Brazil (Type- FSP).

*Phlebotomus intermedius*; FLOCH & ABONNENC, 1941:2 **partim**; BARRETTO, 1946:529.

*Phlebotomus intermedius* var. *acutus* FLOCH & ABONNENC, 1942:12 **partim**; BARRETTO, 1946:529; FLOCH & ABONNENC, 1942:3-6, 12; MARTINS *et al.*, 1978:97.

*Lutzomyia (N.) antunesi*; BARRETTO, 1962:98.

### *Lutzomyia (N.) elongata* (Floch & Abonnenc, 1945)

*Phlebotomus intermedius*; FLOCH & ABONNENC, 1941 (referred as published in 1942): 2, ♂; MARTINS *et al.*, 1978:98.

*Phlebotomus intermedius longiductus* FLOCH & ABONNENC, 1942:3-6, 12-13, ♂; MARTINS *et al.*, 1978:98.

*Phlebotomus elongatus* FLOCH & ABONNENC, 1945:1. Type loc.: Haute Mana, French Guyana.

*Lutzomyia (N.) elongata*; BARRETTO, 1962:98.

Only one specimen of *L. elongata* was studied and the status of this species is doubtful. It was regarded as a valid species (MARTINS *et al.*, 1978; READY & FRAHIA, 1981) and alternatively as a synonym of *Lutzomyia whitmani* (FORATTINI, 1973; YOUNG & DUNCAN, 1994). The examination of the holotype shed little light on its status, because several parts were broken (YOUNG & DUNCAN, 1994).

### *Lutzomyia (N.) shawi* Frahia, Ward & Ready, 1981

*Phlebotomus intermedius*; BRUUNIG, 1957 (Richard Douglas Ward, pers. commun., 1996).

*Lutzomyia* sp. n. 260.43; WARD *et al.*, 1973; WARD & KILLICK-KENDRICK, 1974; WARD & READY, 1975; WARD & FRAHIA, 1977; FRAHIA *et al.*, 1981.

*Lutzomyia shawi* FRAHIA; WARD & READY, 1981: 699. Type loc.: Serra dos Carajás, Pará, Brazil. (Type- IEC).

### *Lutzomyia (N.) umbratilis* Ward & Frahia, 1977

*Phlebotomus intermedius*; ROOT, 1934, fig. 4c (Peru: Iquitos); FLOCH & ABONNENC, 1941: 1-23, **partim**, fig. 1, ♂; FLOCH & ABONNENC, 1942:1-16, fig. 1-3, ♀, ♂; FORATTINI, 1959; FORATTINI, 1960c; FORATTINI *et al.*, 1971: 352 [FSP: slides 5544 and 13836 to 13841 (Eunice Aparecida Bianchi Galati, pers. commun., 1996)]; WARD & FRAHIA, 1977.

*Lutzomyia umbratilis* WARD & FRAHIA, 1977: 314-316. Type loc.: River Jari, Pará, Brazil. (Type-IEC).

The probable synonymy of the specimen represented by ROOT (1934, fig. 4c) to *L. umbratilis* is based on the size of the genital pump of insects belonging to the *L. intermedia* complex [ $> 170 \mu\text{m}$  (MARCONDES, 1996)]; the genital pump ( $112 \mu\text{m}$ ) and filaments of the above referred specimen were very short. Probably the specimens from Amapá (FORATTINI, 1959; FORATTINI, 1960c) and from Amapá and Pará (FORATTINI *et al.*, 1971) are *L. umbratilis* or *L. anduzei* (E. A. B. Galati, pers. commun., 1996).

### *Lutzomyia* (*N.*) *whitmani* (Antunes & Coutinho, 1939)

*Phlebotomus intermedius*; ROOT, 1934:240, **partim** fig. 4b (morph.); FLOCH & ABONNENC, 1941:2-4, ♂; MARTINS *et al.*, 1978:102 (BRAZIL: Bahia: Salvador).

*Phlebotomus whitmani* ANTUNES & COUTINHO, 1939:448. Type loc.: Ilhéus, Bahia, Brazil. (Type- FSP).

*Phlebotomus intermedius acutus*; FLOCH & ABONNENC, 1941:3, ♂; FLOCH & ABONNENC, 1944; YOUNG & DUNCAN, 1994:455; FLOCH & ABONNENC, 1941:3-6, 12, 14; MARTINS *et al.*, 1978:103.

*Phlebotomus intermedius longiductus*; FLOCH & ABONNENC, 1941:3; LEBBE *et al.*, 1987; YOUNG & DUNCAN, 1994:455.

*Lutzomyia* (*Nyssomyia*) *whitmani*; BARRETTO, 1962:98.

Examined material: BRAZIL. Bahia, 1914 (IOC), labeled as *Phlebotomus intermedius*, 1 ♂.

The genital pump of the specimen referred by ROOT (1934: 240, **partim** fig. 4b), from Salvador, State of Bahia, measured  $146.7 \mu\text{m}$  and the genital filaments were 4.66 times longer (ca.  $502 \mu\text{m}$ ). These measures are typical of *L. whitmani*.

### *Lutzomyia* (*N.*) *yuilli* Young & Porter, 1972

*Lutzomyia intermedia*; MORALES-ALARCON *et al.*, 1969; OSORNO-MESA *et al.*, 1972; YOUNG, 1979: 166 (syn.).

*Lutzomyia yuilli* YOUNG & PORTER, 1972: 524. Type loc.: River Anorí, Antioquia, Colombia. (Type- USNM).

*Lutzomyia* sp., near *intermedia*; SHAW *et al.*, 1972, YOUNG, 1979: 164.

### *Lutzomyia* (*N.*) *intermedia* complex

*Phlebotomus Papatassi*; BAYMA, 1923 [**non** *Phlebotomus papatasi* (Scopoli, 1786)] BARRETTO, 1947:206.

*Phlebotomus minutus*; BAYMA, 1923 (**non** *Phlebotomus minutus* Rondani, 1843) after BARRETTO, 1947:206.

*Phlebotomus lutzi*; MANSION-BAHR, 1925 **nom. nudum**; COSTA-LIMA, 1932; BARRETTO & PESSOA, 1946:84; BARRETTO, 1947:206; MARTINS *et al.*, 1978:99; YOUNG & DUNCAN, 1994:457.

*Phlebotomus intermedius*; COSTA-LIMA, 1932, figs. 143-146 (descr. adult); BARRETTO, 1940 (descr. egg, larva, pupa); BARRETTO & PESSOA, 1946:84 (distr.), PESSOA & BARRETO, 1948 (ecol., epid.); MARTINS *et al.*, 1956 (BRAZIL: Minas Gerais) (distr., epid.).

*Psychodopygus intermedius*; FORATTINI, 1971:105 (syst.); FORATTINI, 1973:417 (syst., morph., ecol., epid.); FORATTINI *et al.*, 1976; SILVA *et al.*, 1980; TOLEZANO *et al.*, 1980; GOMES *et al.*, 1982, GOMES *et al.*, 1986, GOMES & GALATI, 1987, 1989, GOMES; COUTINHO *et al.*, 1990, GOMES *et al.*, 1990, GOMES; RABELLO *et al.*, 1990 (ecol., epid.) (São Paulo, Ribeira Valley).

*Lutzomyia intermedia*; COELHO *et al.*, 1967 (exp. inf.); MARTINS *et al.*, 1978: 95-97 (refs, distr.); LIMA, 1986 (ecol.); (ARAGÃO & LIMA, 1987 (distr. vs. climate and vegetation); PASSOS *et al.*, 1990 (epid.) (Minas Gerais, Belo Horizonte, Nova Lima, Sabará); GOMES, 1994 (São Paulo) (ecol., epid., nat. inf.), DOMINGOS *et al.*, 1998 (ecol.) (São Paulo, Ribeira Valley).

*Lutzomyia* (*N.*) *intermedia*; Barretto, 1962:98.

The morphology of the specimens represented by COSTA-LIMA (1932) indicates that

they belong to the *L. intermedia* complex. However, the absence of measurements and the fact that the common duct was not shown makes any further identification risky. COSTA-LIMA (1932) referred some specimens in Mangaratiba (Rio de Janeiro) and in Argentina. This state and this country are, respectively, in the known geographical distribution areas of *L. intermedia* and *L. neivai* (MARCONDES; LOZOVEI & VILELA, 1998).

The specimens collected by FORATTINI *et al.* (1976), SILVA *et al.* (1980), TOLEZANO *et al.* (1980), GOMES, RABELLO *et al.* (1982, 1990) GOMES *et al.* (1986, 1990), GOMES & GALATI (1987, 1989), GOMES; COUTINHO *et al.* (1990) and DOMINGOS *et al.* (1998) in the Ribeira River Valley can only be identified as *L. intermedia sensu lato*, because *L. intermedia* and *L. neivai* occur in Pariquera-Açu, in this valley (MARCONDES, 1996; MARCONDES; LOZOVEI & VILELA, 1998). This region seems to be in the transition zone of geographical distribution of the species.

MARCONDES; LOZOVEI & VILELA (1998) and ANDRADE FILHO *et al.* (1997) cited *L. intermedia* in eastern Minas Gerais and MARCONDES; LOZOVEI & VILELA (1998) cited *L. neivai* in the west of this State. MARTINS *et al.* (1956), COELHO *et al.* (1967) and PASSOS *et al.* (1990) collected sandflies identified as *Phlebotomus intermedius* or *L. intermedia* in and around Belo Horizonte, which is situated in another possibly transitional region. This induced us to consider these insects as belonging to *L. intermedia* complex. An insect from Lapinha Cave (Minas Gerais, Lagoa Santa) was identified as *L. intermedia* (MARCONDES; LOZOVEI & VILELA, 1998), and similarly the male insect collected by MARTINS *et al.* (1957) at this place probably belonged to this species.

The inclusion of *Phlebotomus lutzi*, cited by MANSON-BAHR (1925), in the synonymy of the *L. intermedia* complex, as proposed by COSTA-LIMA (1932), BARRETTO (1947), MARTINS *et al.* (1978) and YOUNG & DUNCAN (1994), is not secure, due to the absence of any information on that 'species', apart of its possible importance on the transmission of *Leishmania*.

Doubtful identification. *Phlebotomus intermedius*; VARGAS & DIAZ-NAJERA (1953:311) (MEXICO, Campeche, El Rifle, 3.I.1953). Material not available for study.

It is very unlikely that the *P. intermedius* referred by VARGAS & DIAZ-NAJERA (1953) is related to the *L. intermedia* complex, due to the its known geographical distribution (Brazil, Argentina, Paraguay and Bolivia) (MARCONDES; LOZOVEI & VILELA, 1998).

## DISCUSSION

Although there are several references to *P. intermedius* and *L. intermedia* in French Guyanne (FLOCH & ABONNENC, 1941, 1942, 1944, 1945; LÉGER *et al.*, 1977), the Musée de Histoire Naturelle and the Institut Pasteur at Paris and this institute at Cayenne do not have material with these labels from French Guyanne (Luc Matile, pers. commun., 1994; François Rodhain, pers. commun., 1995).

As anticipated by ROOT (1934), the *P. intermedius* of the 1920's could be divided among several taxonomic entities. It is possible that the development of other studies of morphology and the use of other techniques could improve the knowledge of the status of the species of the complex and nearby species. References to the finding of specimens belonging to this complex from other countries, besides Brazil, Argentina, Paraguay and Bolivia, should be considered as doubtful and need to be carefully studied.



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